# LOUISIANA TECHNOLOGY INNOVATIONS FUND PROGRESS REPORT 1 March, 2001

for the period ending 31 December, 2000

#### I. DEPARTMENT / AGENCY

Louisiana State University, Department of Physics and Astronomy

## II. PROJECT TITLE

"Training Today's Students for Tomorrow's Internet Work Environment"

#### III. PROJECT LEADER

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## IV. DESCRIPTION OF THE PROJECT

During this project we will develop a system to provide today's school children with experience in using the internet to control, access and operate robotic instruments much in the way that they may in tomorrow's high technology network based work environment. This will include internet control interfaces for the Highland Road Park Observatory telescope, for the ATIC balloon-borne "space" experiment and for a HAM radio satellite communication system. In addition a group of teacher leaders will work with us to develop a curriculum that will provide the context and structure necessary for students to use these internet accessed instruments effectively. During the project we will partner with various community and business organizations such as HAM radio operators, amateur astronomers, Southern University, LaSPACE, and a local television station to provide needed expertise and to enhance the quality of the product. The final products of this project will include a set of operational internet "robots", the materials necessary to train teachers in the use of these devices, the supporting classroom materials to be used by students, and an evaluation of the project effectiveness based upon classroom assessments

#### V. PROJECT STATUS

## A. Brief Summary

During the period June, 2000 through December, 2000 the ROBIE Teacher Leader and Hardware / Software teams made significant progress in realizing the goals of this project. In particular, we concentrated on implementing the ATIC balloon-borne experiment internet interface to accommodate the flight of this experiment from McMurdo, Antarctica one year early during December, 2000. This portion of the ROBIE project was highly successful providing classrooms and the general public with images and videos describing the progress of the

experiment and near real-time flight data for students to analyze. As a result of this change in emphasis, further development on the optical telescope interfaced needed to be delayed until Spring, 2001. However, additional progress was made in developing the HAM radio station lesson plans, internet interface and hardware selection.

# **B.** Accomplishments

During this program period the Teacher Leader group held several meetings in June to outline the teacher guide development effort and spent most of July as well as part of August at LSU working on the guide. The guide is keyed to the Louisiana Science Content standards including "Science as Inquiry", "Physical Science", and "Earth and Space Science". The guide is not intended to be yet another science curriculum, but is planned to be a real teacher working document. All content standard benchmarks are listed along with lesson plans from existing, national science curriculum such as Project Astro and Operation Physics. ROBIE activities are then developed to enhance these lesson plans and/or to fill in gaps. A draft of the ROBIE guide was presented at a teacher workshop and comments were solicited which are now being incorporated into the guide. Non-LTIF funding supports the Teacher Leader group effort associated with this project, including development of classroom lessons for the ATIC, HAM radio and telescope instruments.

On July 14, 2000 NASA notified LSU that the ATIC balloon payload will fly from McMurdo, Antarctica during December 2000 rather than the anticipated flight one year later. To meet this accelerated schedule the PI (Dr. Guzik) and the software programmer who works on the ROBIE interface software (M. Stewart) needed to focus strongly on assuring that ATIC would be successful. Therefore, it was necessary to reorder priorities in the ROBIE program concentrating first on developing an operational ROBIE / ATIC component and delaying further work on the telescope interface until Spring, 2001; following the ATIC flight.

Thus, during Summer / Fall 2000 we focused on implementing the internet interface for ATIC scientific balloon experiment and providing classrooms with near-real time access to flight housekeeping data and associated lessons. This implementation has been highly successful and full information about the ATIC flight in Antarctica can be found at <a href="http://plato2.bro.lsu.edu/aticweb">http://plato2.bro.lsu.edu/aticweb</a>. This web site includes MPEG and WMV format videos on various aspects of the ATIC experiment and daily life in McMurdo, Antarctica, volumes of still pictures taken on-site, information on the ATIC instrument, daily uploads of the payload housekeeping data telemetered via satellite to our ground station, and a collection of classroom lessons that can be used by teachers to illustrate some of the science concepts behind the ATIC experiment. The videos included on the web site were developed in Antarctica by television reporter Bill Rodman and were also featured on the Baton Rouge television station WAFB during December 2000. In addition, WAFB will be sponsoring an hour long documentary on ATIC and scientific balloons that will air in March or April of 2001. This documentary will later be made available to classroom around the state.

After many months of preparation the ATIC experiment was launched from the Ross Ice Shelf just outside of McMurdo, Antarctica on December 28, 2000. Once aloft at about 120,000 feet the winds at this altitude carried the balloon experiment in a circumpolar trajectory taking more

than 16 days to return to the general location of McMurdo where the balloon flight was finally terminated on January 13, 2001. Prior to launch as well as during flight, teachers, students and the general public were able to watch the progress of the mission and learn about science in Antarctica. Several classrooms and teachers, from Louisiana as well as around the nation, have been accessing the information and data on the web site and we have received numerous positive comments. Following the return of the experiment to LSU during spring, 2001 we will continue to maintain and improve the ATIC web site along with its archive of data, pictures and videos to provide Louisiana classrooms with a unique educational resource.

Since development of the ATIC web site, including access to some of the flight data in near-real time, has been supported by this LTIF project, acknowledgement of the LTIF support can be found on the web site "Participants" page (<a href="http://plato2.bro.lsu.edu/aticweb/Participants.htm">http://plato2.bro.lsu.edu/aticweb/Participants.htm</a>).

In the mean time work on the HAM radio component of this project continued at LSU. The Teacher Leader group that developed the ATIC lessons has now developed preliminary lessons for the radio station. The lessons include studies of satellite tracking, the doppler effect and data telemetry. In addition, we have been able to obtain software that will provide a web-based interface to the radio equipment. Using this interface, classrooms will be able to access the radio, tune the frequency, point the antenna, listen to the radio and download audio files for frequency spectrum analysis. We are now in the process of ordering the radio equipment and should have this component of the project complete by Spring, 2001.

We have also established part of the Teacher Workstation cluster at the Highland Road Park Observatory consisting of ten desktop computers and a color laserjet printer networked to the internet. This cluster is used by the Teacher Leader group to develop the ROBIE teacher guide, including searching for Web resources, testing potential education software, writing documents and developing web pages. Further, the workstation cluster is used as an education resource during classroom field trips and public nights at the observatory. As planned we also purchased the StarLab portable planetarium to assist the Teacher Leaders in developing the ROBIE guide. This StarLab planetarium is now in place at the observatory and is being used to provide teachers and students with basic knowledge of the sky.

Finally, we have also made some progress in establishing a robust, internet interface for the HRPO telescope and the CCD camera. We have written a NT Service routine that interfaces with the PC/TCS telescope control software over the serial link and can communicate with other computers on a LAN via a named pipe. With this service routine we have then been able to build a plug-in for the Starry Night Pro software. Starry Night provides a simulation of the night sky while the plug-in displays the pointing direction of the telescope and allows the telescope to be moved merely by selecting an object with the computer mouse. The Teacher Leader group has reviewed this preliminary interface and believes that this would work well in the classroom. For the CCD camera, we are working with a vendor who is developing an ActiveX interface for their camera control software. With the ActiveX control we will be able to build camera control directly into a web page using Active Server Pages. This new feature is currently in beta test stage and we are working with the vendor to resolve various bugs that we have uncovered. Work on both the telescope and camera control software will be completed during spring, 2001.

## **C. Problems Encountered**

As mentioned above NASA accelerated the ATIC development schedule and consequently the PI (Dr. Guzik) and the software programmer who will work on the ROBIE interface software (M. Stewart) needed to focus strongly on assuring that ATIC is successful. In fact, both Dr. Guzik and M. Stewart were off-campus during all of August, 2000 and were on-site in Antarctica from October, 2000 through January, 2001. This has required a change in the ROBIE development schedule initially emphasizing the ATIC component and delaying the telescope implementation. With the ATIC component now complete, effort will focus on the radio and telescope components during Spring, 2001 to bring the project back on schedule.